

# A NEW SPECIES OF TERRESTRIAL MICROHYLID FROG FROM PAPUA NEW GUINEA

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## Summary

BURTON, T. C. & STOCKS, R. (1986) A new species of terrestrial microhylid frog from Papua New Guinea. *Trans. R. Soc. S. Aust.* 110(4), 155-158, 28 November, 1986.

*Copiula pipiens* sp. nov. occurs in the Wewak area, on the north coast of Papua New Guinea, 500 km north-west of the known range of its congeners. It is characterized by a relatively long snout, relatively high-pitched call and possession of a ligamentous connexion between the ilium and sacrum. Analysis of its relationships will follow description of other new species.

KEY WORDS: frog, microhylid, *Copiula*, new species, morphology.

## Introduction

The microhylid fauna of Papua New Guinea is speciose and diverse, containing over 100 described species in 14 genera (Zweifel & Tyler 1982; Burton 1986). The taxonomic diversity is related to the ecological diversity of the family: Menzies (1975) and Tyler (1976) discuss species which are fossorial, terrestrial, arboreal and aquatic.

*Copiula* Mehely was resurrected from the synonymy of *Cophixalus* by Menzies & Tyler (1977) to accommodate three species: *C. fistulans*, *C. minor* and *C. oxyrhina*, characterised by a thick rostral dermal gland which gives a white projecting tip to the snout; premaxillae which possess alary processes which are relatively broad at the base; and terminal finger-pads which are smaller than the terminal toe-pads. *C. fistulans* and *C. minor* are described by Menzies & Tyler as fossorial whereas *C. oxyrhina* is terrestrial, i.e., hiding underground by day, and moving about on the ground by night (Menzies 1975).

In March 1983, one of us (R.S.) collected nine specimens of a new species of *Copiula* from the floor of a secondary growth forest at Wirui, near Wewak, slightly above sea level. The site is more than 500 km north-west of the known ranges of previously described *Copiula* species.

## Materials and Methods

The specimens reported here are deposited in institutions abbreviated in the text as follows: American Museum of Natural History (AMNH); British Museum (Natural History) (BMNH); South Australian Museum (SAM); University of Papua New Guinea (UPNG).

The following specimens of *Copiula* were examined for comparison with the new species: *C. fistulans* Menzies & Tyler AMNH 81129, 81130; SAM R5852, R5879, R6382-3, R9443-9448, R14239-14250, R14497 (holotype); *C. minor* Menzies & Tyler AMNH 56908 (juv.), 56939-40, 56958, 56960, 56971-2, 56986, 56997-8, 57046-7, 57050-54; SAM R15245 (paratype); *C. oxyrhina* Boulenger BMNH 1947.2.11.99, 1947.2.12.4 (syntypes); AMNH 59894-59896; UPNG 1371, 2612, 4311, 5204, 5205.

Methods of measurement follow Tyler & Menzies (1971) except that the measurement of the length of the hind leg follows Zweifel (1972). Abbreviations: S-V, snout-vent length; HW, head width; HL, head length; TL, tibia length; E, eye length; E-N, distance between anterior edge of eye opening and centre of external naris; IN, internarial distance; T, diameter of tympanum; SN, snout length-distance between centre of external naris and tip of snout. Tape recordings of male calls were made in the field using a Sony TC-D5 tape recorder with a Sony BHF 60 cassette, and analysed subsequently with a Kay Digital Sona-graph Model 7800. Field temperatures were taken with a mercury total immersion thermometer. Drawings were made with the aid of a Wild M5 stereo microscope with a camera lucida attachment. The specimen SAM R29782 was cleared and double-stained for skeletal examination by the alcian blue-alizarin red technique of Dingerkus & Uhler (1977).

## *Copiula pipiens* sp. nov.

FIGS 1-3

*Holotype*: SAM R29779, an adult male collected at Wirui, 1 km from Wewak (3°35'S, 143°35'E) by R. Stocks on 29.iii.1983.

*Definition*: Small terrestrial species (males 23.0-24.7 mm; female 27.8 mm S-V) characterized by a high-pitched call (dominant frequency 4-5 kHz), possession of a ligamentous attachment between

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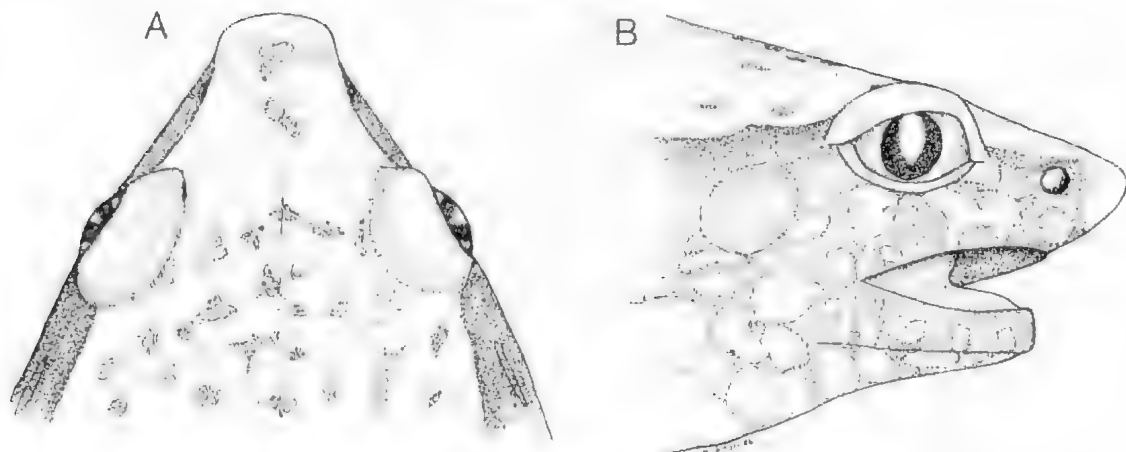


Fig. 1. A, dorsal and B, lateral views of the head of the holotype of *Copiula pipiens* sp. nov.

ilium and sacrum, and a relatively long, pointed snout.

**Description of holotype:** Head almost triangular because of protruding snout (Fig 1); longer than broad (HL/HW 1.18); head width less than one-third snout to vent length (HW/S-V 0.31); snout long, culminating in rounded white tip from dorsal aspect; length of snout much greater than length of eye (SN/E 1.50); distance between eye and naris much less than internarial distance (E-N/IN 0.67); nares lateral; eye small; interorbital distance equivalent to more than twice length of eyelid; canthus rostralis well defined and strongly curved when seen from above; loreal region concave; tympanum small and indistinct (Fig. 1); prepharyngeal ridge single and denticulate; tongue moderately broad, more than  $\frac{1}{2}$  free posteriorly. Vocal sac single, medial entry via gaping holes.

Hind limbs moderately long (TL/S-V 0.45). Fingers and toes bearing small terminal discs with marginal grooves (Fig. 2); toe discs larger than finger discs. Fingers in order of length  $3 > 4 > 2 > 1$ , toes  $4 > 3 > 5 > 2 > 1$ ; subarticular tubercles poorly or not developed on digits; inner metatarsal tubercle small, oval; outer metatarsal tubercle absent; fingers and toes unwebbed (Fig. 2).

Dorsal and ventral skin smooth; no supratympanic fold.

In preservative dorsal surface mid-brown, darker medially than laterally, uniformly spotted darker brown; tip of snout unpigmented; faint raised midvertebral line from snout to vent; loreal region dark brown with cream blotches; broad, irregular dark brown postocular stripe extends from orbit to beyond scapular region; flanks light brown mottled with dark brown blotches; anterior and posterior surfaces of legs dark brown spotted lighter;

undersurface cream, faintly mottled with brown pigment in submandibular region and thigh, pigment becoming more intense towards knee.

In life, ground colour of dorsum pale orange-pink; ventral surfaces creamy-white with brown markings; vent region suffused by orange-pink.

**Dimensions of holotype:** S-V 23.5 mm; HW 7.3 mm; HL 8.6 mm; TL 10.5 mm; E 2.3 mm; E-N 1.6 mm; IN 2.4 mm; T 1.3 mm; SN 3.4 mm.

**Etymology:** The specific name refers to the high-pitched call of the males of this species.

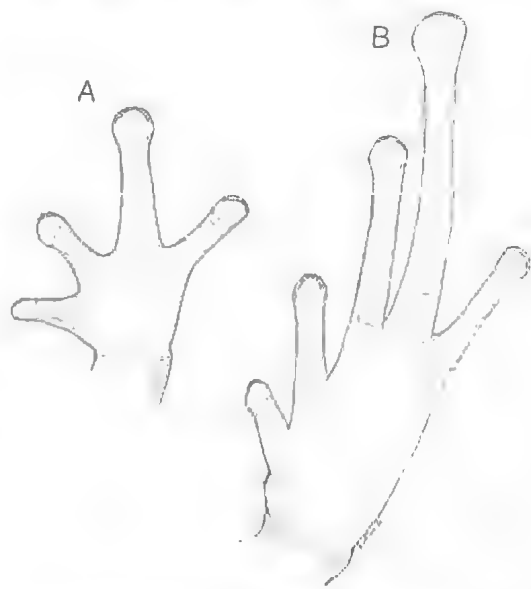


Fig. 2. A, palmar surface of left hand and B, plantar surface of left foot of the holotype of *Copiula pipiens* sp. nov.

### Variation

There are eight paratypes: AMNH 123698 (adult ♂), SAM R29780-2 (3 adult ♂♂) (SAM R29782 cleared and stained), UPNG 7205-6 (adult ♂♂) 7207 (gravid ♀), 7208 (adult ♂). All specimens were collected with the holotype. Much of the skin of the trunks and limbs of four specimens (UPNG 7205, 7207, SAM R29781-2) had been removed for chemical analysis elsewhere before the specimens became available for measurement and close examination.

The adult males measure 23.0-24.7 mm S-V, and the single female 27.8 mm S-V. The mean diameter of 2 unpigmented mature ova in the body cavity is 2.3 mm. Hind limbs are moderately long, compared with those of congeners (TL/S-V 0.44-0.49). HL/HW varies from 1.02-1.18 (n=5). SN/E varies from 1.45-1.62. E-N/IN ranges 0.67-0.77.

In the five intact specimens there was variation in the intensity of mottling of the gular region, between very little (SAM R29780) and strongly mottled (SAM R29779). Similarly, the ground colour of the mid-dorsum varied from mid-brown (SAM R29779) to deep purplish-brown (UPNG 7206), and the lateral stripe from dark brown (SAM R29779) to almost black (SAM R29780).

As the single female had been skinned prior to examination, no comparison of the external morphology of the sexes could be made.

### Advertisement call

The call is a rapid series of high-pitched cheeps, uttered at a rate of approximately 10 notes/sec for a period of up to 20 sec. Most of the acoustic energy is focussed between 4 and 5 kHz (Fig. 3) at 25°C, the attack of each pulse is very sharp, and there is frequency modulation within each pulse. The pulses are somewhat irregular in interval.

*Calling behaviour:* Calls were uttered on the surface of the forest floor, sometimes from under leaves and other forest debris. Calling animals were as little as 1 m apart, and were difficult to distinguish, because when one individual commenced calling, many (if not all) of the other males in the vicinity joined in, and they all stopped calling at about the same time, so that the collector had little time to locate one individual. There was a gap between successive such "choruses" of a few to many minutes.

### Habitat and distribution

The type locality at Wirui is open secondary woodland with large trees and a few shrubs on level ground. It is traversed by a well-worn path, and includes a permanent freshwater pond. *C. pipiens* was also heard calling, and one was seen, beside a dirt road between Most and Sourì, just off the main road between Wewak and Passam, six km south of Wewak (altitude 400 m). This location is

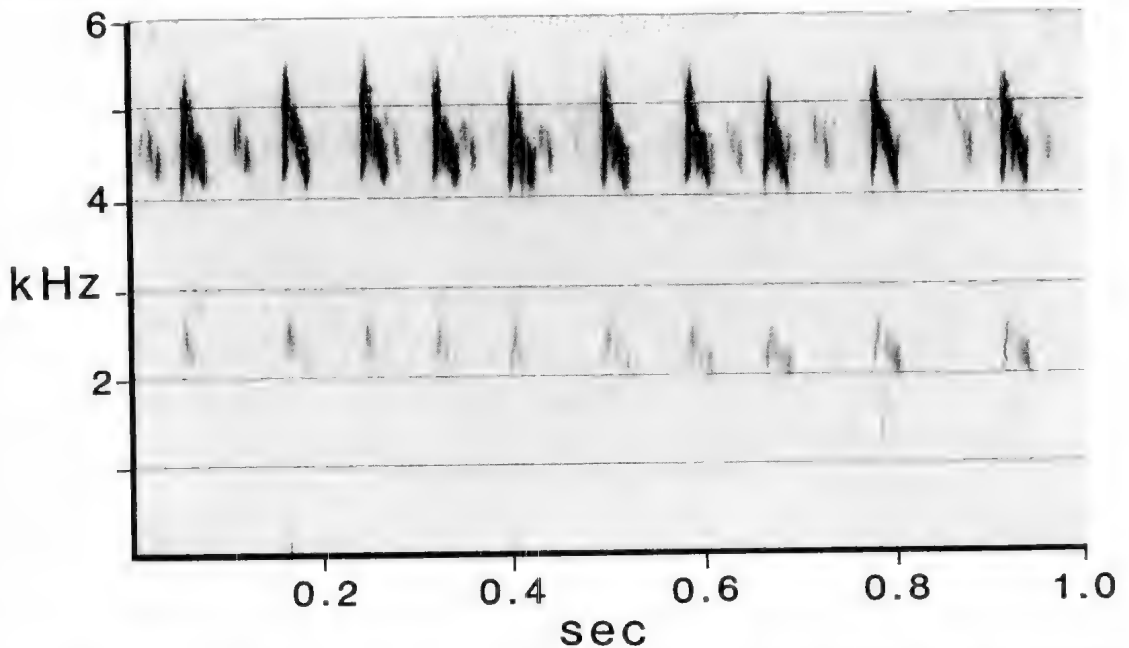


Fig. 3. Sonagram of part of call of *Copiula pipiens* sp. nov. recorded at Wirui, 19.05 hr, 29 March 1983, air temperature 25 °C. Traces between 2 and 3 kHz are regarded as artefacts, possibly the result of overload during recording. Filter 300 kHz.

a gully on a steep hillside in thick secondary growth with heavy ground cover from fallen branches, ferns and other plants.

The species is known only from the Wewak district.

#### Comparison with other species

(a) *External morphology*: The smoothly streamlined body shape, the relatively featureless palmar and plantar topology, the slightly expanded and grooved digital discs, broader on the toes than on the fingers, and the prominent, translucent, white-tipped snout are typical of *Copiula*, and, in general appearance, *C. pipiens* is difficult to distinguish from its congeners. However, it may be distinguished from *C. fistulans* by size: the minimum recorded S-V length for an adult male *C. fistulans* is 28.4 mm (Menzies & Tyler, 1977), compared with the maximum length of male *C. pipiens*, S-V 24.7 mm. The female *C. pipiens*, S-V 27.8 mm lies below the minimum recorded for adult female *C. fistulans*, S-V 31.1 mm.

*Copiula minor* is comparable to *C. pipiens* in size: males S-V 18.5-24.5 mm ( $n = 11$ ), females 21.8-23.8 mm ( $n = 4$ ), but *C. minor* and *C. pipiens* differ markedly in proportions: the legs of *C. minor* are shorter, maximum TL/S-V 0.43, cf. *C. pipiens* minimum TL/S-V 0.44; the snout of *C. minor* is less elongated (maximum SN/E 1.36, cf. *C. pipiens* minimum SN/E 1.45); and the nares are relatively closer in *C. minor* (minimum E-N/IN 0.85, cf. *C. pipiens* maximum E-N/IN 0.72).

*Copiula oxyrhina* is a variable species in need of revision (Burton, in prep.), and no external character in *C. oxyrhina* is sufficiently consistent to allow confident generalizations. However, the dorsa of specimens designated *C. oxyrhina* are less spotted than those of *C. pipiens*, and the postocular stripe is usually shorter and narrower.

(b) *Internal anatomy*: *C. pipiens* differs from all described species in direct ligamentous attachment between the ilium and sacrum. In the other species the illa of the two sides are connected by a

superficial ligament which overlies the dorsal musculature, and there is no direct attachment between the ilium and sacrum.

(c) *Voice*: The call of *C. pipiens* is much higher pitched than its congeners. The dominant frequencies of the calls of *C. fistulans* and *C. minor* are approximately 1 kHz, and that of *C. oxyrhina* is approximately 2 kHz (Menzies & Tyler, 1977). By comparison, the dominant frequency of *C. pipiens* at approximately the same temperature is 4-5 kHz.

#### Calling behaviour

The pattern of calling in groups, with many individuals joining in, and then all calls ceasing abruptly for some minutes is a form of behaviour we have observed in other microhylid species: *Barygenys flavigularis*, *Barygenys* sp. nov., *Cophixalus cheesmanae*, *C. variegatus* (Wau call type), *Copiula fistulans*, *Hylophorbus rufescens*, *Mantophryne lateralis*, *Oreophryne hiroi*, *Phrynomantis stictogaster* and *Xenobatrachus suberoceus*.

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